The meteorological report of Mr. George Duthie, for the year ending March 31, 1902, states that he has in operation 7 barometric stations, 3 climatological or thermometric stations, and 9 simple rainfall stations. Of the total number 16 are in Mashona Land and 13 in Matabele Land.

In Nature for May 7, 1903, Mr. William J. S. Lockyer compares the rainfall in several regions of the globe with the variations of the sun spots since 1800, hoping thereby to elucidate the occasional diminution of rain and the consequent droughts. He begins by adopting 5-year means instead of the means of single years, and from these he eliminates the minor irregularities by drawing smoothed or free-hand curves. He finds a long period variation in the rainfall, the greatest rainfall occurring in the years 1815, 1845, 1878–1883, while the rainfall is decidedly deficient in the years 1825–1830, 1860, and 1893–1895. Mr. Lockyer finds indications of a connection between the sun spots and the periodicity of rainfall, such that the minima of sun spots in 1843 and 1878 preceded the maxima of rainfall, he therefore ventures to prolong the curve, and virtually predicts a minimum of sun spots and maximum of rainfall in 1914.

In his annual report for the year ending June 30, 1902, Prof. S. P. Langley describes the work done at his astro-physical observatory in Washington, and which relates mostly to the absorption of the solar rays in the earth's atmosphere as well as in the sun's atmosphere. He says:

> A presumption exists, almost amounting to certainty, that the total radiation of the sun is variable in some relation to the appearance of sun spots, but nothing is yet known to fix definitely the amount of this supposed variability or to measure its effect upon the earth.

WEATHER BUREAU MEN AS INSTRUCTORS.

The course of instruction in meteorology and climatology offered by the Editor to the students of Columbian University, Washington, D. C., has been taken by only one student during each of the past two years. During the college year 1901–2 Mr. R. S. Bassler (the son of Mr. S. S. Bassler, Local Forecast Official at Cincinnati) pursued a course on meteorological instruments, embracing the Editor's Treatise on Meteorological Apparatus and Methods and some other more recent works. During the college year 1902–3 Mr. Alvin P. Burrows, of the Central Office, pursued the course in climatology, which, however, was not given as a course of lectures, but consisted of a study of a manuscript treatise on The Climates of the Globe, by Prof. Alexander Woeikof of the University at St. Petersburg. This treatise was translated from the Russian for the Editor by Prof. A. Ziwet, of the University of Michigan, revised by the author, and is now again in course of further revision in order to adapt it especially to use by American students.

Prof. F. H. Bigelow's course in the Columbian University, in higher meteorology and solar physics, has been taken by Mr. Herber L. L. Solyom, who received his degree of Master of Science (M. S.) from the Columbian University on the completion of the year's work. This course included the mathematical analysis summarized in Bigelow's Eclipse Meteorology and Allied Problems. The thesis submitted by Mr. Solyom related to the present status of research into solar radiation, the solar constant, the radiation function as applied to the earth's atmosphere, and the effect of pressure and temperature upon the solar spectrum.

Mr. S. S. Bassler, Local Forecast Official, Cincinnati, Ohio, delivered an address on May 10, 1902, before the Teachers' Association in Hamilton County, Ohio, on instruction in meteorology in the primary school. Mr. Bassler conducted a course in meteorology at the summer school of the University of Cincinnati from July 5 to September 13, 1901, consisting of ten lectures, embracing the following subjects:

July 5. Introduction; explanation of instruments, charting temperatures, and drawing isotherms.

July 12. Temperature; chapter 2 of Waldo's Elementary Meteorology, charting pressure, and drawing isobars.

July 19. Pressure and wind; Waldo's Elementary Meteorology, chapters 3 and 4; charting isotherms and isobars together.

July 26. Moisture; Waldo's Meteorology, chapters 5 and 6; preparation of a complete weather map.

August 2. Written examination and review.

August 16. primary circulation of the atmosphere (Waldo, chapter 8).

August 23. Secondary circulation of the atmosphere (Waldo, chapter 9).

August 30. Miscellaneous phenomena (Waldo, chapter 10).

September 6. The weather and the weather map (Waldo, chapter 11).

September 13. General review of the whole subject, with lantern slides.

During the subsequent school year, 1902–3, Mr. Bassler sent to every school in Cincinnati the daily weather map and special notices of all weather changes for the benefit of the scholars and their families. Fifty-six schools and colleges and 60,000 pupils entered into this arrangement.

Mr. J. W. Bauer, Section Director, Columbia, S. C., reports that on November 12 he lectured to the public school pupils and patrons at Laurens, S. C., on the history and the work of the Weather Bureau.

Mr. E. A. Beals, Forecast Official, Portland, Oreg., reports the visit of the high school class in physical geography to the office of the Weather Bureau on October, 16, 1902.

Mr. A. H. Bell, Observer, Eureka, Cal., reports a lecture on April 20, 1903, before the Eureka Club, on the uses of meteorology; very great interest was shown in the subject and a movement was made toward a permanent meteorological outfit for educational purposes.

Mr. W. T. Blythe, Section Director, Indianapolis, Ind., reports a lecture on forecasting before the junior class of the Indiana Medical College. The Secretary of the Horticultural and Agricultural Society of Richmond, Ind., Mr. Walter S. Ratliff, advocated the importance of a series of talks of a practical nature, on the relations of the Weather Bureau to the pursuits of man. Commenting on this, Mr. Blythe said:

> There is no longer any doubt in my mind but that the leaders in educational institutions, whether they be in universities, colleges, or farmers' institutes, who persistently decline to avail themselves of and disseminate the meteorological and climatological knowledge gained by the Weather Bureau during the last third of a century, are doing less than their duty to the public.

Mr. Blythe reports that a model Weather Bureau outfit has been established at the Manual Training High School in Indianapolis, and the class of twenty pupils in physiography, under Mr. M. H. Stuart will keep a weather record and study meteorology. It is not the purpose of the course to develop weather prophets but to show the students that the work of the Weather Bureau is a consistent course of reasoning based on scientific principles and not simply guesswork. Mr. Stuart's instruction is broad and excellent.

Mr. Edward H. Bowie, Section Director, Galveston, Tex., reports attending the Farmers' Institute and other agricultural organizations at Austin, Tex., February 12 and 13, 1903.

These lectures were published in full in the Proceedings of the Congress of the State Farmers' Institutes and afforded Mr. Bowie occasion to meet a large number of State officials and prominent agriculturists, and contributed greatly to the intelligent appreciation of the work of the Weather Bureau in that State. Among other things, Mr. Bowie said:

> The Weather Bureau maintains nine regular stations within the State of Texas; we telegraph to forty-one distributing centers the daily fore-

casts and warnings of cold waves, frosts, snows, high winds, etc., and then these forecasts are duplicated to the postmasters of approximately nine hundred post offices in the State to be distributed through the Rural Free Delivery Service; in case of severe weather changes every point in the State having telegraphic facility is advised of the impending severe weather; these are disseminated in accordance with arrangements that have already been outlined; the stockmen of the western and northwestern portions of your State are advised of the approach of the dreaded "norther" that they may care for the stock; the farmers of the river bottoms are warned of the approach of disastrous floods, as for example the floods of the Brazos in 1902; the sugar planters are kept advised when a severe freeze threatens the destruction of their cane crops and they are enabled to cut and windrow the cane and thus bid defiance to the elements; the truckers and fruit raisers are warned of weather changes injurious to their interests else they can not grow these crops with profit; the transportation companies make use of the weather forecasts and warnings to protect the shipments in their charge, and are thus enabled to give lower rates for transportation; the cotton grower, the sugar planter, and the rice grower are presented through the medium of the press and daily bulletins with information that will keep them, and others interested, in touch with the weather conditions prevailing from time to time and the progress of the growing crops; * * * the statistics that are gathered from this Bureau from one hundred voluntary observers throughout the State are of inestimable value in determining crop conditions, and allow me to state that the statistics gathered from this source during the past four months prove conclusively that not within the past score of years has the soil and subsoil of the farms of Texas been in better condition to receive the seed during the coming springtime and to carry the winter grain to a time of bountiful harvest.

Mr. F. H. Brandenburg, Forecast Official, Denver, Colo., addressed the school teachers of Denver on April 5, 1902:

The growth of the Weather Bureau was traced from the organization of the service to the present time; the excellent system for the collection and dissemination of weather, crop, and climatological information was outlined, and the value of the forecasts, warnings, etc., described.

The lecture closed with a full explanation of the weather map, copies of which were in the hands of those present.

Mr. Allen Buell, Observer, San Antonio, Tex., reports being visited in succession by all the classes in the schools in that town that have received instruction regarding the use and operation of the instruments, the construction of weather maps, and the method of weather forecasting.

Mr. William G. Burns, Section Director, Phoenix, Ariz., delivered a lecture before the American Climatological Association at its meeting at that place on June 3, 1902. His address has been published in pamphlet form. It gives a comparison between climates of different places in Arizona. Among other things, he touched—

briefly on the effect of irrigation in increasing the humidity of the atmosphere in this locality. A drop of ink let fall into a hogshead of water is certainly there, but it would take a careful chemical analysis to make a determination. The water vapor evaporated from the irrigated fields adds to the humidity of the atmosphere, but when the small area under irrigation is compared with the adjacent desert region and the great capacity of surrounding space for water vapor is taken into account we conclude that it has a salubrious rather than a deleterious effect. During crop-growing seasons, when the water is spread over the greatest possible area, relative humidity as low as 3 per cent has been measured.

Months.	Mean of dry bulb.		Mean of wet bulb.		Mean relative humidity.
	8 a. m.	8 p. m.	8 a. m.	8 p. m.	
1901.	°F.	°F.	°F.	°F.	%
January	43	62	38	48	47
February	46	65	43	51	59
March	48	71	40	51	38
April	51	78	41	54	29
May	61	87	49	60	30
June	68	97	50	62	19
July	80	104	65	71	33
August	79	100	68	72	43
September	68	95	54	64	28
October	60	83	50	60	39
November	51	72	46	55	49
December	40	62	32	45	32
Annual	58	81	48	58	37

In a table of climatological data for Phoenix, Ariz., for the year 1901, Mr. Burns gives the mean of the wet-bulb thermometer at 8 a. m. and 8 p. m., seventy-fifth meridian time, and as such data are not generally given, although of considerable interest, we append the preceding table, copied from the appendix to his address:

Mr. Ford A. Carpenter, Observer, San Diego, Cal., lectured several times before the senior class of the State Normal School during May, 1902. His lectures included not merely a description of instruments, but also numerous points of interest in connection with local forecasting, some of which we quote from the San Diego Union, as follows:

Preceding rain the barometer fluctuates rapidly, rising and falling a few hundredths of an inch during the general fall. The actual height of the barometer does not matter, often the heaviest rain begins after the barometer has started on the upward curve. Clearing weather and a rising barometer often occur together. A rapid rise in the barometer often presages decidedly cooler weather at San Diego. The humidity often decreases for a few hours before a rain. In fact a drop of from 10 to 15 per cent below the normal of 70 per cent of relative humidity generally precedes rain by from six to twelve hours. Conditions may be ever so threatening in other respects, but if the humidity is above 70 per cent, precipitation is extremely doubtful, except in the form of fog or mist. Humidity observations are often the only way of distinguishing between a rain-bearing cloud and high fog. A cloud below the top of San Miguel is simply lifted fog, whereas a cloud capping the mountain is always a threatening condition. In the spring the rain winds precede the rain by from twelve to twenty-four hours, but in the fall and winter, the south or southeast wind may blow steadily for thirty-six or forty-eight hours before rain falls, and when such a rain does commence a generous precipitation occurs. Rain winds must always be brisk, with a steadily increasing velocity; fair weather winds are light and shifting, except only the northwest trade winds of summer, which may reach twenty-five miles per hour. In this locality cirro-cumulus clouds, having well-defined darkened convexities, nearly always bring rain. The first appearance of the cirro-cumulus is generally followed by rain within twelve hours. In the beginning of the rainy season the sky will be made beautiful by these delicately rounded masses for two or three days before the rain sets in. A thick sheet of cirro-stratus cloud will sometimes herald a general rain. During the rainy season a very small cloud, like a streamer of a dark shade, is generally entwined about a threatening cumulus cloud and always precedes rain. These clouds strongly resemble closely twisted flax, and apparently indicate a condition of complete local saturation; they have no direction of their own, but depend upon the movement of the parent cloud.

Another cloud condition, from which positive information may be obtained, is the saw-tooth edges of cumulus clouds. Other conditions may be ever so threatening, but if the clouds have this wave-like appearance, with their crests inclined to the south, no rain will fall. These clouds are frequently seen on the western horizon, and clearly indicate the direction of the upper air currents. The directions of these upper projections, whether they point north or south, indicate respectively fair weather or rain.

On March 9, 1903, Dr. Isaac M. Cline, Forecast Official, New Orleans, La., before a large audience, delivered a lecture in Alumni Hall as one in the course of the Jesuits' alumni series, giving especial attention to weather forecasting for the Gulf States. At the conclusion, he said:

If the predictions of those who pretend to make long range forecasts are examined, it is found that they bunch three to five days together and style that a storm period and claim that stormy conditions will occur on one of those dates. Now, we have already noticed that the number of disturbances styled storms or low pressure areas, which cross the United States from west to east, average one in every three days. In fact, there is never a day but that the weather chart shows a storm in some part of the United States. Bear in mind that the so-called long range weather forecaster always says the disturbance will occur about a certain date, either within two days before or within two days after. This gives five days within which the disturbance may occur. Now let us take New Orleans for example. Select any five days and you will find that within those we have nearly every kind of weather which occurs at the season of the year in which the five days are selected. In fact there are hardly three successive days without the passage of a disturbance. Such forecasts are indefinite as to the date and character of the weather which may be expected. You never hear of any lives or property being saved by the so-called long range forecasts. Interests affected by severe weather conditions never look at such warnings. The captains of vessels, sugar planters, orange growers, truck farmers, and shippers look constantly to the United States Weather Bureau for warnings. The Weather Bureau forecaster must specify the weather which will prevail during each twelve-hour period for every locality in his district. These warnings are always issued twenty-four and thirty-six sometimes forty-eight and seventy-two hours in advance. Warnings of the severe freeze

of December 14 to 18, 1901, were issued by the Weather Bureau forty-eight hours in advance. Each locality was advised forty-eight hours in advance just what temperature to expect. Sugar planters in Louisiana and Texas, who had interested themselves in the Weather Bureau warnings, windrowed all the cane they possibly could. One plantation windrowed nearly 2000 acres of cane, and others in proportion to amount standing. A careful estimate of the value of the cane saved as a result of this one warning, is one million of dollars, for cane that was not windrowed was lost. The Sugar Planters Journal, December 20, 1902, in commenting on these warnings, and the confidence of the sugar planters, says:

"This faith in the prognostications of the weather man was largely brought about by the accurate forecast of the destructive freeze of last December (1891), when the loss to the sugar industry of Louisiana figured, perhaps, upwards of several millions of dollars. Had more planters windrowed promptly upon receiving warning last year (1901) from the Weather Bureau the loss would have been greatly curtailed."

With the United States Weather Bureau such warnings as that above referred to are the rule and such large savings of property are continually taking place throughout the United States. Notwithstanding that the Weather Bureau forecasters have attained a high percentage of accuracy every effort is being made to improve the forecasts. All the changes which we experience at the earth's surface are influenced by conditions in the upper atmosphere. We want records at 1000, 2000, 3000 feet, etc., above the earth, of the changes taking place. These will be obtained by means of kites and balloons and on mountain peaks.

Mr. N. M. Cunningham, Observer, reports explaining the instruments and work of the Weather Bureau to the class in physics of the high school at Valentine, Nebr. He will give a discourse on meteorology before the Teachers' Institute of that place.

Mr. Norman B. Conger, Inspector, United States Weather Bureau, read a paper before the Section of Geology and Geography, Michigan Academy of Science, March 27, 1902, at Ann Arbor, embracing his own personal observations on the Water Temperature of the Great Lakes, more especially of Lake Superior. Mr. Conger also lectured on the afternoon of March 13, 1903, at the Normal School, Washington, D. C., on the wind movement and deductions from the daily weather maps.

Mr. E. A. Evans, Section Director, Richmond, Va., reports finishing his course of lectures on meteorology to the students of the Medical College of Virginia. The course occupied four months and consisted of one hour per week. Students of the junior class were required to attend, but it was optional with the senior class. The course paid especial attention to the relations of weather and disease and a series of diagrams were constructed embodying studies on pneumonia, bronchitis, croup, and influenza. The quiz was adopted as a means of reinforcing instruction. The junior class numbered 48 students. The general character of the course was suggested by Dr. Phillips and the charts were based upon data published in his Climate and Health.

Mr. R. H. Dean, Observer, La Crosse, Wis., reports a lecture on meteorology to the students of King's College.

Mr. H. B. Egbert, Voluntary Observer and Professor of Mathematics and Astronomy at Buchtel College, Akron, Ohio, under date of January 28, 1903, states that in his class work he uses the daily weather maps received from Cleveland, Ohio, and makes his students practise the art of making individual forecasts. During the first part of the term the morning maps are used, but during the latter part the evening data are received and manuscript charts are compiled; isobars and isotherms are drawn and forecast studies are based thereon. This course has continued for three years, and is considered to be a very profitable feature of their scientific education. A simple nephoscope has been constructed for the use of one student who has made a study of clouds the subject of her graduating thesis. It is to be hoped that fuller details of this work may be communicated to the MONTHLY WEATHER REVIEW.

Dr. O. L. Fassig, Section Director, Baltimore, Md., by special invitation delivered an illustrated lecture on Ancient and Modern Methods of Weather Forecasting on February 20, 1903, before the Franklin Institute of Philadelphia, an institution that has been made famous in the annals of meteorology by the labors of Benjamin Franklin, James P. Espy, A. D. Bache, Joseph Henry, and other distinguished men.

Mr. Robert Q. Grant, Observer, Lexington, Ky., delivered a series of lectures on weather forecasting and meteorology before the senior class of the Kentucky State College during the spring of 1902.

Mr. A. E. Hackett, arranged to give a course in climatology in the Medical Department of the University of Missouri, during the second semester of the scholastic year 1902–3. The course is required for the degree of doctor of medicine, and is confined to a study of the climatic features of the United States with reference to their influence upon health and disease, special attention being given to the comparative hygienic values of the climates of those sections that are frequented as health resorts.

Mr. Enoch G. Johnson, in charge of the weather station in the United States House of Representatives, Washington, D. C., reports as follows:

A feature of the work which has grown during the session is the talks given to excursion parties largely made up of schools and school teachers, upon the work, purpose, and achievements of the Weather Bureau. In many instances notes were taken by the visitors for use in school work upon their return home. As the Capitol is the point of special interest to all visitors, and as excursion parties are more numerous than formerly, this seems to me to be one of the best means of giving out Weather Bureau information to a worthy and intelligent portion of the public. As the maximum of excursion parties occurs during the Christmas holidays and again during Easter week, I think the Capitol a good place in which to disseminate information relating to the Weather Bureau and its work. The talks mentioned above were generally supplemented by furnishing copies of Explanation of the Weather Map and History of the Weather Bureau, with an occasional record sheet from the triple register or rain gage and such literature pertaining to the Bureau as was available at the time.

Prof. A. G. McAdie delivered a lecture upon fog phenomena at the Teachers' Institute, Redwood City, Cal., on April 29. He also took part in the discussions on climatology on April 23 at the thirty-third annual meeting of the Medical Association of the State.

Mr. E. W. McGann, Section Director, New Brunswick, N. J., addressed the pupils of the High School at Pemberton, N. J., on March 19, 1902, on How Forecasts are made and Disseminated by the United States Weather Bureau. Mr. McGann also addressed the Farmers' Institute at Sommerville, N. J., December 5, 1902, on the Weather Bureau and the Weather Forecasts.

Mr. J. B. Marbury, Section Director, Atlanta, Ga., lectured before the Young Men's Christian Association of that city March 22, 1902, on The Weather Bureau and Its Relations to the Public. He also reports a course of lectures on the work of the Weather Bureau, delivered to the Boys' High School in November, 1902.

Mr. A. J. Mitchell, Section Director, Jacksonville, Fla., delivered an address on Uncle Sam and His Weather, on Farmers' Institute Day, at the winter assembly of the Chatauqua of the Tropics, Melbourne, Fla., March 7, 1902.

Mr. L. H. Murdoch, Section Director, Salt Lake City, Utah, addressed the Engineering Society of the University of Utah on March 24, 1902, on the Weather Bureau and its Work, having especial reference to the daily weather map. Mr. Murdoch reports much interest in meteorology in the normal school connected with the university. The pupils are taught to read the barometer, rain gage, and thermometer. The temperature readings are plotted daily for a period of several months, and the resulting curves show quite clearly the seasonal temperature changes. The different cloud forms are studied and the pupils make daily forecasts from the map of the Weather Bureau.

Mr. W. S. Palmer, Section Director, Cheyenne, Wyo., reports an instructive paper on the United States Weather Bureau, read before the Young Men's Literary Club of Cheyenne on November 21, 1902.

Mr. Henry R. Patrick, Observer, Weather Bureau, Marquette, Mich., reports a talk on January 22, 1903, to a large

class of pupils from the Ely Grammar School on the Marquette Weather Station and How Storms are Charted. A similar address was given on February 12 to the class in geography and physics of the Northern State Normal School. Mr. Patrick also reports a lecture before the pupils of the Froebel School on February 26.

Mr. H. W. Richardson, Forecast Official, Duluth, Minn., addressed the pupils of the Blaine High School, West Superior, Wis., on April 23, 1902, his subject being The Weather Bureau. This was followed by an address before the physiography class at the same school on The Circulation of the Atmosphere. Mr. Richardson also reports an address on Instruments, Weather Maps, and Forecasts on the afternoon of February 14, 1903, before the students in physiography of the West Superior State Normal School when assembled in the Weather Bureau office. Mr. Richardson delivered a series of lectures on the subject of meteorology to the Superior State Normal School, closing the course in April, 1903. Letters have been received from J. A. Merrill, vice-president of this school, highly commendatory of these lectures, which indeed seem to have aroused much local interest in the subject. He states that "The charts and data published in the MONTHLY WEATHER REVIEW are in constant use in our classes," and he wishes to get similar data concerning Europe, Africa, and South America.

Mr. James H. Scarr, Observer, Sacramento, Cal., as reported in the Union of that city, delivered an interesting lecture on January 30, 1903, on the Work of the Weather Bureau, from which we quote the following paragraph:

> The most popular weather belief in some parts of the country is that the weather conditions are undergoing radical changes. In this particular the modern meteorologist is an iconoclast, ruthlessly smashing the idols of the past and the present with his long and carefully kept records of actual conditions. That there are cycles in weather conditions is a theory, but the recorded observations of the past century fail to reveal anything corroborative. The planting of trees, the practise of irrigation and the cultivation of the soil, especially in the great semiarid plains east of the Rocky Mountains were once believed to have an influence on the climate, but both former and later experience show the probability that the conditions that have rendered these plains semiarid and treeless still prevail uninfluenced by the puny operations of man.

Mr. W. A. Shaw, Observer, Northfield, Vt., delivered a course of two hours per week in meteorology to the senior class, Norwich University, during the winter term of eleven weeks, 1902–3. Waldo's Elementary Meteorology was used as a textbook, with lectures on special subjects not fully treated therein. Special attention was given to weather reports and forecasts and studies of daily maps and climatological charts. For the past seven years the senior class has been required to take this course and pass examinations on the same. Nineteen men took the course during the term 1902–3.

Mr. J. Warren Smith, Section Director, Columbus Ohio, reports attending the Farmers' Institute at Morristown, Bellemont County, Ohio, on February 11 and 13, 1903. The following outline of lectures delivered during the college years of 1901–2 and 1902–3 by Mr. Smith, at the Ohio State University, is submitted by him and may be of assistance to those delivering similar courses at other universities:

OUTLINE OF LECTURES ON METEOROLOGY GIVEN AT THE OHIO STATE UNIVERSITY.

Lecture No. 1.—Introduction.
- Object of course and possible value of study of subject.
- Daily journal of the weather to be kept.
- Question box for correlating cause and effect.
- Phenological studies and notes.
  - Importance and need; progressive work in Canada.
- Historical sketch:
  - Early instrumental records:
    - Florence, Italy, 1643.
    - Charleston, S. C., 1738.
    - Cambridge, Mass., 1743 to 1776.
    - Other New England records in eighteenth century.
    - New Bedford, Mass., 1812 to date, by two observers.
    - Smithsonian, 1852.
    - Signal Service, 1870.
    - United States Weather Bureau, 1891.
  - Present system:
    - Stations; men; instruments; observations and elements; telegraph system; code; necessity for accuracy; map making.
    - Maps discussed; maps as supplement to text book.

Lecture No. 2.—The atmosphere.
- Evolution, composition, and office.
- Relation to geological and geographical processes.
- Weight; pressure.
- Impurities; molds; bacteria; Aitken's dust counter; Krakatoa.
- Elasticity of air; height of atmosphere.
- Meteorological elements.
- Instrumental observations.
- Physical meteorology.
- Climatical meteorology.
- Applied meteorology.
- Weather versus climate.

Lecture No. 3.—Temperature.
- Molecular theory of heat.
- Diffusion of heat.
- Solar radiation.
- Astronomical relations; seasons.
- Distribution of heat on surface of earth.
- Effect on land and water.
- Atmospheric transmission, absorption, and radiation.

Lecture No. 4.—Thermometry.
- History of thermometers:
- Description and explanation; corrections.
- Self-recording thermometers.
- Exposure; instrument shelters.
- Isothermal lines and surfaces.
- Temperature gradients; horizontal, vertical.
- Adiabatic changes.
- Daily, monthly, and annual mean temperature.
- Temperature affected by latitude, elevation, topography, and wind direction.
- Temperature ranges and extremes.
- Normal temperatures.

Lecture No. 5.—Illustrated review.
- Slides showing stations, mountain observatories, thermometers, instrument shelters, kites, sounding balloon records, temperature charts, etc.

Lecture No. 6.—Pressure.
- Weight and pressure of air:
- Variation with altitude.
- Thickness of atmosphere.
- Laws of gases:
- Effect of change in temperature upon density.
- Arrangement of air under gravity.
- Physiological effects of abnormal pressure changes.

Lecture No. 7.—Barometry.
- History of barometers; description; corrections; records; reductions.
- Fluctuations:
  - Diurnal; annual; irregular.
- Isobaric lines and surfaces; gradients.
- Geographical distribution of pressure; causes.
- Correlation of wind and pressure.
- Correlation of temperature and pressure.

Lecture No. 8.—Winds.
- Anemometers; anemoscopes.
- Annual and diurnal march of velocity.
- Variations with altitude.
- Diurnal and annual changes in direction.
- Cyclonic and anticyclonic influences.
- Temperature; gravity theory of winds.
- Monsoons; land and sea breezes; mountain and valley breezes.
- Correlations with temperature and pressure.

Lecture No. 9.—Moisture.
- Water vapor.
- Evaporation; humidity; hygrometry; condensation; dew point.
- Clouds; classes and theory of formation.
- Fog:
  - Condensation upon dust; Aitken's dust counter.
  - Condensation upon electric ions.

Lecture No. 10.—Precipitation.
- Description of rain gages.
- Rainfall; causes:
  - Influences of wind direction and topography.
  - Geographic distribution.
  - Hail; snow; dew; frosts; conditions favorable for formation of frost; methods of protection.
- Excessive rainfalls; droughts.
- Retardation of adiabatic cooling by latent heat of condensation.
- Influence upon forests.

Lecture No. 11.—Optical Meteorology.
Reflection; refraction; dispersion; diffraction; absorption.
Transparency of air.
Mirage; halos; parhelia; Krakatoa; rainbows; coronæ.
Atmospheric electricity; lightning; lightning rods; aurora.
Sunspots; St. Elmo's fire.
In connection with this lecture I give an illustrated review, showing slides upon the following subjects:
Barometer; rain gage; sunshine recorder; anemometer; anemoscope; clouds; halos; fog; barometer charts, etc.
Lecture No. 12.—General circulation of atmosphere.
Explanation; causes; difference in temperature; rotation of earth; explanation of low pressure at poles and tropical high pressure belt; relation of pressure and air movements; vertical currents; surface currents; trade winds; monsoons; calm belts or areas; the typical local circulation over the United States.
Lecture No. 13.—Secondary air circulation.
Cyclones and anticyclones:
Description; classes; distribution of pressure, temperature, wind, and weather in cyclones and anticyclones.
Effect of earth's rotation.
Laws of storms; tropical cyclone; extratropical cyclones; hurricanes.
The theory of cyclones and anticyclones:
Ideal systems; condensation theory; tangling or eddy theory; wave theory.
Lecture No. 14.—Local winds, tornadoes, etc.
Thunderstorms: Classes; cause; time of day; relation to cyclones; movement; mountain thunderstorms; thunder squall; derecho; hail; lightning; theory of formation; tornadoes and spouts; air circulation; how formed; movement; vortex; funnel cloud; waterspouts.
Lecture No. 15.—Illustrated review.
Cyclones and anticyclones and their movement.
Pressure, temperature and wind charts for the globe and correlations.
Ocean currents.
Thunderstorms; ideal air circulation; lightning flashes.
Tornadoes; relation to cyclonic areas; damage.
Lecture No. 16.—Weather.
Elements; weather of different zones; in United States; summer and winter; cyclonic and anticyclonic control.
Local signs and prognostications.
Weather predictions; how distributed.
Lecture No. 17.—Climate.
Weather versus climate.
Most important factors in climate.
Continental; oceanic; of different zones; of different continents.
Lecture No. 18.—Climate of United States.
Main types; pressure; wind; temperatures.
Lecture No. 19.—Climate of United States.
Rainfall; snowfall; humidity; clouds; sunshine.
Climate of Ohio; temperature; wind; rain; snow.
Lecture No. 20.—Examination.
In the above course Waldo's Elementary Meteorology was used as the text-book. If I were giving 40 lectures instead of 20, I should use Davis' Elementary Meteorology.
The daily weather maps are consulted at each session, the principles of weather forecasting explained, and the different weather conditions correlated with the conditions shown on the maps. Instruction is also given in drawing isobars, isotherms, and in shading precipitation areas, part of an occasional hour being given up to this. At least one lecture is given at the local Weather Bureau office, where the instruments and all the work of the office is explained. The daily journals of the students are examined and criticised several times.

Mr. Charles Stewart, Observer, Spokane Wash., addressed the pupils of the Spokane High School on March 21, 1902, on Weather Changes and their Causes. The physical geography class of this school visited the Weather Bureau office at Spokane on April 21 and 22. The station instruments and some phases of Weather Bureau work were explained by Mr. Stewart.

Mr. A. H. Sullivan, Observer in charge, Grand Junction, Colo., reports that a class of young ladies and gentlemen from the High School visited the Weather Bureau office and received a lecture on meteorology from the observer in charge.

Mr. L. M. Tarr, Observer, New Haven, Conn., delivered a course of sixteen lectures to a class of thirteen at Yale University, during the college year, 1901–2. The following subjects were considered: A short history of meteorology; the height, composition, pressure, temperature, and moisture of the atmosphere; evaporation, condensation, and precipitation; general circulation of the atmosphere; development and movement of storms; electrical and optical phenomena; description of instruments; laboratory work at the Weather Bureau office.

Mr. Tarr has been appointed lecturer in meteorology at Yale University, and in return the privileges of the University have been extended to him. His course has been enlarged and will hereafter consist of two hours per week during the second half of the college year.

Mr. N. R. Taylor, Observer, Tampa, Fla., reports a lecture given on May 8, by request of the faculty of Mallicoat, Tampa Preparatory School.

Mr. John R. Weeks, Observer, Macon, Ga., reports that the faculty of Mercer University in that city is considering the advisability of adding meteorology and advanced physical geography to its curriculum. By permission of the Chief of Bureau, it is probable that Mr. Weeks will have charge of instruction in these branches and the time required in attendance at the University will be about two hours per week. It is gratifying to note this evidence of the increased interest being taken in this subject in this part of Georgia. Mr. Weeks also reports an informal address on The Relations of the Weather and the Weather Bureau to the Fruit Industry, delivered at the meetings of the Georgia Fruit Growers Association, March 5 and 14, 1902, and March 25, 1903.

Mr. W. M. Wilson, Section Director, Milwaukee, Wis., reports an address delivered by him at Oconomowoc, March 18 and 20, 1902, before the Wisconsin Farmers' Institute, which has been published in the Bulletin No. 16 of that institute, and from which we take the following extract:

Previous to 1870 few people in the United States conceded the possibility of foreseeing the weather, even twenty-four hours in advance, with any greater certainty than that attained by the wisdom of the "oldest inhabitant," but during that year the public was awakened to the fact that the United States Government had established a department for this very purpose, and began dimly to comprehend that it was not only possible to predict the weather with a certain degree of accuracy, but that it could be done with very great benefit to the commercial and agricultural interests of the country. Since that time familiarity with daily accounts of the verification of the prediction of storms, cold waves, etc., has resulted in the public thought far outstripping the actual advance of the science in this respect, and the country now demands a forecast for a season or a year in advance, where it once considered it a wonderful achievement to predict the weather for twenty-four hours.

In pressing this demand it is said that after thirty years of observation and experience the Weather Bureau should be able to furnish a fairly accurate forecast for more than one or two days, and in truth it should, but let me say that we have not been negligent nor indifferent to this demand. We have attacked this problem of long-range forecasts from every conceivable standpoint, vigorously, and at short range. We have carried our instruments to the highest mountain peaks on the continent; we have taken our lives in our hands and explored the upper atmosphere by means of balloons; we have placed meteorographs in kites and sent them up to the distance of a mile in the hope of finding something in the upper strata that would lead to a solution of the problem; we have studied the influence of the moon and the planets and experimented with electricity and magnetism, but thus far we have found nothing to lead us to believe that there is a possibility at the present time of making even a useful, not to say accurate, forecast of the weather for a period much above forty-eight hours. I am aware that there are men in this country * * * who claim to be able to make accurate predictions of the weather for a year in advance of their fulfilment, but so far as we are able to learn, their theories, which are usually based upon the very questionable influence of planetary and stellar bodies have not commended themselves to a single reputable scientist. In this connection I am constrained to say that a foreknowledge of the weather for a month or a year in advance is not in the possession of any living man at the present time.

[The difficulties will undoubtedly be overcome eventually. We need not be discouraged by our slow progress, and we need not have recourse to false methods. Man is here to conquer nature. The attempt to do so strengthens and develops him. Every year witnesses some new conquest, and there is as yet no sign of our having reached our limit.—*C. A.*]

MISS ALICIA DE RIEMER.

The announcement of the sudden death, on April 8, at Milwaukee, of Miss Alicia De Riemer came as a great shock to